1. Simplify \( \frac{x+1}{1-\frac{1}{x}} - 1 \)

2. Factor five of the following: \(3x^4 - 7xy - 6y^4, a^{4m} + 2a^m + 1, 2x^4 - 8, 1 + a^5, 4a^4 + 3a^2b^2 + b^4, 6xy - 4y + 9x - 6, x^6 + 8\)

3. Solve \( \frac{x^2}{3a} + x - a = 5a \)

4. Solve \( \begin{cases} x - y = 5 \\ xy = 104 \end{cases} \)

5. Multiply \( x^{\frac{3}{2}} - 2x^{\frac{1}{2}} + 1 \) by \( x^{\frac{1}{2}} - 1 \). Express the product with radical signs.

6. Twice the product of two consecutive numbers exceeds 6 times their sum by 6; find the numbers.

7. Solve \( \begin{cases} bx + ay = 2a^2b \\ 2x + y = a(2a + b) \end{cases} \)

8. Solve \( 6 - \sqrt{4x + 1} = \frac{5}{\sqrt{4x + 1}} \)

9. Find the two sums into which \( \$1200 \) must be divided in order that the interest on one at 6% shall equal the interest on the other at 4%.

10. A man bought 5 sheep for what 2 cows cost; had he paid \( \$2 \) less a piece for the sheep, 5 sheep and 6 cows together would have cost \( \$150 \). Find the cost of each.

11. Write the first four terms of the expansion of \((2a + 3b)^7\). Give all computations required.

12. Prove that if four quantities are in proportion they are in proportion by composition.